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Simplot

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January 18, 2019

OK

Arthur Burbank
USDA Forest Service
4350 South Cliffs Dr.
Pocatello, ID 83204

Subject: **Biological Selenium Removal Treatment Technology**
Water Treatment Pilot Study
December 2018 Progress Report

Dear Art,

This progress report summarizes key activities in December 2018 associated with Phase 2 of the Water Treatment Pilot Study located near Hoopes Spring. This Pilot Study is being conducted as part of the Smoky Canyon Mine Remedial Investigation/Feasibility Study (RI/FS) to provide information on the effectiveness of the active biological treatment system in removing selenium and other COPCs from South Fork Sage Creek Springs and Hoopes Spring.

Work related to the approved Phase 2 Pilot Study continues at the site in accordance with the Final *Phase 2 Pilot Study Work Plan and Sampling and Analysis Plan, Ultra-Filtration/Reverse Osmosis and Biological Selenium Removal Fluidized Bed Bioreactor Treatment Technology* (Phase 2 WP/SAP).

Identification of Deliverables and Data Transmittals

There were no outstanding deliverables or transmittals for the month of December. At the time of this report, we have received laboratory data for Week 42 and 45. Week 44 samples were not delivered to the lab within some of the sample hold times due to a courier issue. Sampling was conducted Week 45 to replace the Week 44 samples. Preliminary laboratory data are presented in Table 1. The field data for the Week 42 and 45 sampling events is summarized in Table 2.

Completed Activities

The following activities associated with the Phase 2 Pilot Study were completed in December 2018:

- Continued system operation and treatment of selenium.

The Treatment System Pilot (TSP) influent concentration for Week 42 and 45 were 149 ug/L and 147 ug/L respectively. The Treatment System Pilot effluent concentration for Week 42 and Week 45 were 30.9 and 22.6 ug/L. The removal efficiency ranged from 79% to 85 % for total selenium removal.

The average flow of the TSP was 1,767 gpm for December. Since full scale operations began in early December 2017 approximately 967 million gallons of impacted water has been treated. The

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mass of selenium removed from December 2017 through December 2018 is approximately 990 pounds.

Upcoming Activities

The following activities associated with the Phase 2 Pilot Study are planned through January 2019:

- Continue system monitoring in accordance with the sampling and analysis plan.

Please contact me if there are questions regarding this monthly progress report.

Sincerely,

Jeffrey Hamilton
Environmental Engineer

cc:

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Table 1-1
Laboratory Results Full Analyte List

		Week 42		
	Station >>	Influent	Ultra Filtration Backwash	Effluent
	Sample ID >>	SC1218-LSSHS-IN001	SC1218-LSSHS-UFB001	SC1218-LSSHS-EF001
	Date >>	12/5/2018		
Analyte	**Units**			
General Chemistry				
Alkalinity, Total as CaCO3	mg/L	200	40	210
Bicarbonate, as CaCO3	mg/L	200	40	210
Carbonate, as CaCO3	mg/L	1 U	1 U	1 U
Ammonia, as N	mg/L	0.026 U	0.026 U	0.026 U
Biochemical Oxygen Demand	mg/L	2 U	2 U	2 U
Chemical Oxygen Demand	mg/L	5 U	5 U	5 U
Chloride	mg/L	11.6	1.67	15
Fluoride	mg/L	0.293	0.0735 J	0.321
Hardness, as CaCO3	mg/L	221	38.4	230
TDS	mg/L	344	36	324
TOC	mg/L	0.5 U	0.5 U	0.5 U
TSS	mg/L	2 U	2 U	2 U
Nutrients				
Nitrate + Nitrite, as N	mg/L	0.312	0.12	0.226
Nitrate, as N	mg/L	0.31	0.12	0.23
Sulfate	mg/L	56.7	9.21	67.6
Sulfide	mg/L	1 U	1 U	1 U
Phosphorus, Total	mg/L	0.0358	0.0252	0.216
Major Cations and Anions				
Calcium, Dissolved	mg/L	63.7	12.3	66.7
Magnesium, Dissolved	mg/L	23.9	4.59	25.1
Potassium, Dissolved	mg/L	0.722	0.196 J	0.783
Sodium, Dissolved	mg/L	7.53	1.97	7.96
Metals and Metalloids				
Aluminum, Dissolved	mg/L	0.0076 U	0.0076 U	0.0076 U
Aluminum, Total	mg/L	0.0076 U	0.0298 J	0.0076 U
Antimony, Dissolved	mg/L	0.000198 J	0.0000901 J	0.000256 J
Antimony, Total	mg/L	0.00046 J	0.000222 J	0.000203 J
Arsenic, Dissolved	mg/L	0.000398 U	0.000398 U	0.000398 U
Arsenic, Total	mg/L	0.000611 J	0.000398 U	0.000398 U
Barium, Dissolved	mg/L	0.0497	0.00963	0.0345
Barium, Total	mg/L	0.0502	0.00896	0.0388
Beryllium, Dissolved	mg/L	0.0000624 J	0.000047 U	0.0000701 J
Beryllium, Total	mg/L	0.0000623 J	0.000047 U	0.0000595 J
Boron, Dissolved	mg/L	0.0123 J	0.00784 J	0.013 J
Boron, Total	mg/L	0.0136 J	0.00924 J	0.0133 J
Cadmium, Dissolved	mg/L	0.0000362 U	0.0000362 U	0.0000362 U
Cadmium, Total	mg/L	0.0000362 U	0.0000362 U	0.0000362 U
Chromium, Dissolved	mg/L	0.000381 J	0.000129 J	0.000341 J
Chromium, Total	mg/L	0.000921 J	0.000718 J	0.000747 J
Cobalt, Dissolved	mg/L	0.000124 J	0.0000592 J	0.00842
Cobalt, Total	mg/L	0.000128 J	0.0000771 J	0.00843
Copper, Dissolved	mg/L	0.0000418 U	0.0000674 J	0.0000928 J
Copper, Total	mg/L	0.000358 J	0.000704 J	0.000784 J
Iron, Dissolved	mg/L	0.01 U	0.01 U	0.0201 J
Iron, Total	mg/L	0.01 U	0.0398 J	0.374
Lead, Dissolved	mg/L	0.0000554 U	0.0000554 U	0.0000554 U
Lead, Total	mg/L	0.0000554 U	0.0000554 U	0.0000554 U
Manganese, Dissolved	mg/L	0.000307 J	0.000238 J	0.0256
Manganese, Total	mg/L	0.00062 J	0.00293	0.0262
Mercury, Dissolved	mg/L	0.000051 J	0.000055 J	0.000053 J
Mercury, Total	mg/L	0.000046 J	0.000048 J	0.000055 J
Molybdenum, Dissolved	mg/L	0.00202	0.000356 J	0.0137
Molybdenum, Total	mg/L	0.00211	0.000343 J	0.0137
Nickel, Dissolved	mg/L	0.0000815 J	0.0000533 U	0.00762
Nickel, Total	mg/L	0.000445 J	0.000478 J	0.00912
Selenium, +4 (selenite)	mg/L	0.00005 U	0.00005 U	0.027
Selenium, +6 (selenate)	mg/L	0.15	0.0271	0.00273
Selenium, Dissolved	mg/L	0.151	0.0267	0.0294
Selenium, Total	mg/L	0.149	0.0226	0.0309
Silver, Dissolved	mg/L	0.0000221 J	0.0000172 U	0.0000217 J
Silver, Total	mg/L	0.0000207 J	0.0000172 U	0.0000172 U
Thallium, Dissolved	mg/L	0.0000657 U	0.0000657 U	0.0000657 U
Thallium, Total	mg/L	0.0000657 U	0.0000657 U	0.0000657 U
Uranium, Dissolved	mg/L	0.00155	0.00022 J	0.00165
Uranium, Total	mg/L	0.00166	0.000223 J	0.00174
Vanadium, Dissolved	mg/L	0.00081 J	0.00014 U	0.000417 J
Vanadium, Total	mg/L	0.00285	0.00236	0.00247
Zinc, Dissolved	mg/L	0.00613	0.00223 J	0.00102 J
Zinc, Total	mg/L	0.00774	0.00126 J	0.00069 J

Notes:

Results presented are preliminary, and have not been validated at the time of this report.

U - Analyte not detected above the method detection limit (MDL).

J - Result is estimated.

Table 1-2
Laboratory Results Full Analyte List

		Week 45		
Station >>		Influent	Ultra Filtration Backwash	Effluent
Sample ID >>		SC1218-LSSHS-IN002	SC1218-LSSHS-UFB002	SC1218-LSSHS-EF002
Date >>		12/26/2018		
Analyte	**Units**			
General Chemistry				
Ammonia, as N	mg/L	0.026 U	0.026 U	0.026 U
Biochemical Oxygen Demand	mg/L	2	2 U	2
TSS	mg/L	2 U	2 U	2 U
Nutrients				
Nitrate, as N	mg/L	0.38	0.14	0.42
Sulfide	mg/L	1 U	1 U	1 U
Phosphorus, Total	mg/L	0.0226	0.0167	0.155
Metals and Metalloids				
Selenium, Dissolved	mg/L	0.162	0.0208	0.0238
Selenium, Total	mg/L	0.147	0.0201	0.0226

Notes:

Results presented are preliminary, and have not been validated at the time of this report.

U - Analyte not detected above the method detection limit (MDL).

J - Result is estimated.

Table 2
Field Water Quality Data

		Parameter >>	Dissolved Oxygen	ORP	pH	SC	Temperature	Turbidity
		Units >>	mg/L	mV	SU	umhos/cm	C	NTU
Station	**Sample ID**	**Date**						
Week 45								
Influent	SC1218-LSSHS-IN002	12/26/2018	7.31	76	7.5	506	13.52	1.2
Ultra Filtration Backwash	SC1218-LSSHS-UFB002	12/26/2018	7.77	80	7.55	104	13.29	1.4
Effluent	SC1218-LSSHS-EF002	12/26/2018	7.68	75	7.49	477	13.34	9.2

Notes:
Week 42 field parameters were not collected due to the water treatment plant sending their multimeter in for servicing.